

# NSLS

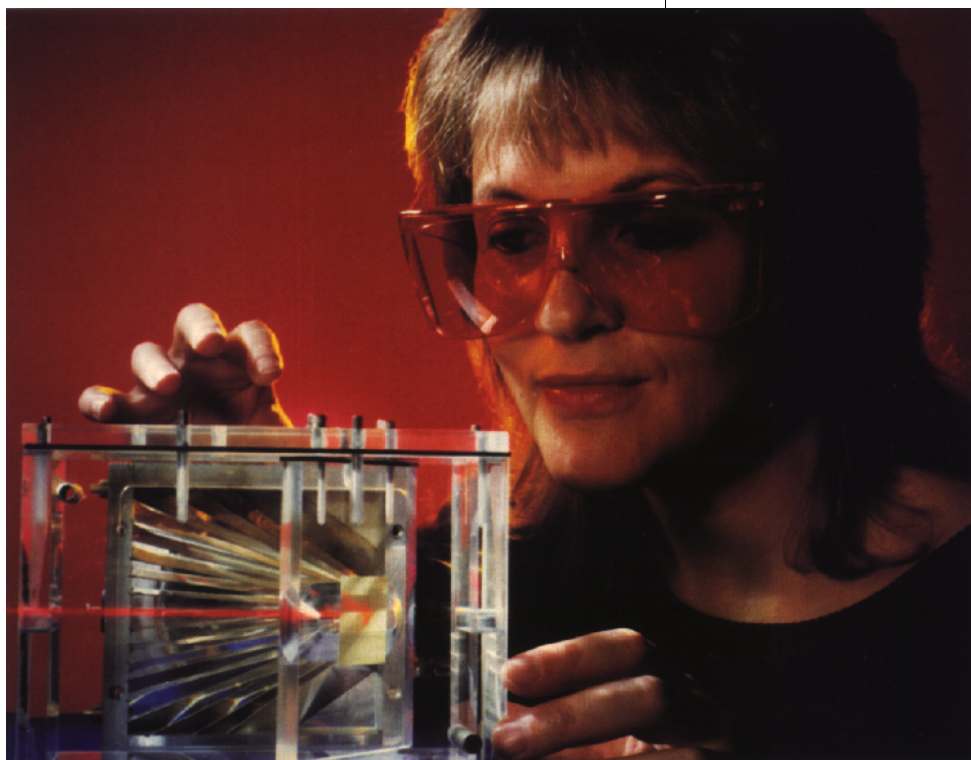
**T**he National Synchrotron Light Source (NSLS) at Brookhaven National Laboratory (BNL) is dedicated to the production of synchrotron radiation. Since its construction in the early 1980s the facility has undergone a major four-year upgrade and is continually improved to take advantage of the latest technology in storage rings, beamline equipment, and insertion devices.

NSLS operates two electron storage rings producing high brightness synchrotron radiation in the infrared, visible, ultraviolet, and X-ray regions of the electromagnetic spectrum. The VUV Ring, with 25 beamlines, supports two insertion devices. The X-ray Ring has a total of 60 beamlines and currently supports five insertion devices. NSLS also has user laboratories and a wide range of research equipment to support basic and applied studies in many scientific disciplines and using a variety of techniques.

A large number of NSLS beamlines have been designed and built by Participating Research

Teams (PRTs). These groups are consortia of users, mostly from outside BNL – from industry, universities, and national laboratories – with common research interests and large, long-range research programs. Over the years, PRTs have invested over \$126 million and about 1,200 staff-time years of labor to design and install their own experimental equipment, aided by BNL staff. The PRTs have priority access for as much as 75 percent of their beamline's operational time. The remaining time on PRT beamlines, as well as on NSLS-operated beamlines, is available to outside customers and is allocated on the basis of peer-reviewed research proposals.

Within a single year, 2,228 scientists from over 350 different institutions visited NSLS to perform experiments. Most of the research – for which there is no beamline charge – is published in the open scientific literature. Scientists may also engage in proprietary work, in which case they pay a full-cost-recovery rate. This allows them to take title to any inventions and treat as proprietary all data generated during work at NSLS.



**North Carolina State University scientist Geraldine Lamble collaborates on environmental remediation studies at the National Synchrotron Light Source. Using this detector and a technique called X-ray absorption fine structure, which can be done at NSLS because it delivers highly intense and tunable X-rays, researchers are investigating the behavior and treatment of metal contaminants in soils.**

# NATIONAL SYNCHROTRON LIGHT SOURCE

## ACCOMPLISHMENTS

Fundamental advances in surface science have resulted from NSLS studies of the arrangements of atoms and their electrons on boundaries between solids, liquids, gases, or a vacuum.

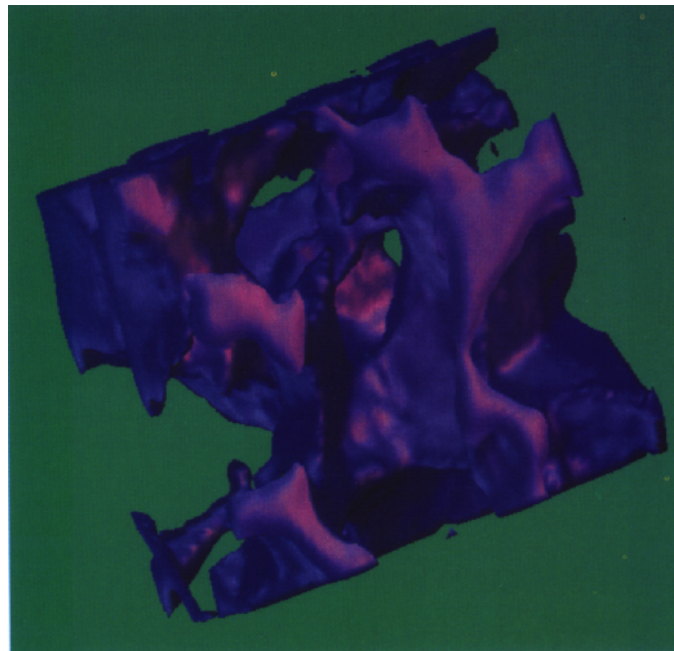
New materials characterization techniques developed or perfected at NSLS include high resolution infrared spectromicroscopy, new imaging techniques, magnetic scattering, magnetic circular dichroism, and spin polarized photoemission. Materials characterization is also a critical element in the development of new materials, products, and technologies.

Crystallographers from universities, medical foundations, and pharmaceutical companies determined the structure of many biological molecules and how they interact with specially designed drugs. Some of the diseases being studied are arthritis, hypertension, depression, and AIDS.

IBM researchers developed the technique of X-ray lithography to create smaller and faster microchips. Lucent Technologies is extending this technique to extreme ultraviolet projection lithography, creating even smaller features.

## USERS

- Argonne National Laboratory
- Bayer Corporation
- Brandeis University
- Columbia University
- The Dow Chemical Company
- DuPont Merck Pharmaceuticals
- Exxon Research & Engineering Co.
- Harvard University
- Howard Hughes Medical Institute
- IBM Corporation
- Lawrence Berkeley National Laboratory
- Lucent Technologies
- MIT
- Naval Research Laboratory



**X-ray tomograph image of a sample of Fontainebleau sandstone showing its pore geometry. This kind of measurement helps Exxon researchers test theories developed to predict fluid flow in the extraction of fossil fuels. Scientists from Kimberly-Clark are also using three-dimensional microtomography, but to analyze the structure of fibrous networks of paper products. The resolution of this technique is 1,000 times greater than using conventional computer-aided tomography.**

- National Institute of Standards & Technology
- Polaroid Corporation
- Princeton University
- Rutgers University
- State University of New York
- The Upjohn Company
- University of Pennsylvania
- Yale University